CLAIMS

1. A reflector for exposure light, characterized in that:

said reflector for exposure light has a multi-layer film structure that a plurality of layers are repetitively stacked in the same order;

a periodical length of a repetitive stack unit of said multi-layer film structure is set so that a center of full width at half maximum of a reflectance via a predetermined number of reflectors becomes coincident with a center wavelength of said exposure light to be reflected, and

said reflector for exposure light is used when said exposure light is exposed to a subject to be exposed in a lithography process for manufacture of a semiconductor device.

2. A reflector for exposure light according to claim 1;

characterized in that:

in addition to said periodical length of said repetitive stack unit of said multi-layer film structure, a film thickness ratio between a plurality of layers constituting said repetitive stack unit is set so that said center of full width at half maximum of said reflectance via said predetermined number of reflectors becomes coincident with said center wavelength of exposure light to be reflected.

3. A reflector for exposure light according to claim 1;

wherein said exposure light is any one of extreme ultraviolet light, ultraviolet light, an electron beam, an X-ray, a charged particle ray, a radial ray, or a visible light.

4. A reflector for exposure light according to claim 1;

wherein said multi-layer film structure is made by stacking constituted of Si and Mo in the same order.

5. A reflector for exposure light according to claim 4;

wherein said multi-layer film structure is stacked on a glass substrate comprising SiO_2 from said glass surface toward the surface of said reflector.

6. A method of manufacturing a reflector for exposure light, characterized in that;

a multi-layer film structure made by repetitively stacking a plurality of layers in the same order is formed by setting a periodical length of a repetitive stack unit of said multi-layer film structure and a film thickness ratio between a plurality of layers constituting said repetitive stack unit in such a manner that a center of full width at half maximum of a reflectance via a predetermined number of reflectors becomes coincident with a center wavelength of exposure light to be reflected.

7. A method of manufacturing a reflector for exposure light according to claim 6;

wherein said exposure light is any one of extreme ultraviolet light, ultraviolet light, an electron beam, an X-ray, a charged particle ray, a radial ray, or a visible light.

8. A method of manufacturing a reflector for exposure light according to claim 6;

wherein said multi-layer film structure is made by stacking constituted of Si and Mo in the same order.

9. A method of manufacturing a reflector for exposure light according to claim 8;

wherein said multi-layer film structure is stacked on a glass substrate comprising SiO_2 from said glass surface toward the surface of

said reflector.

10. A mask used when exposure light is exposed to a subject to be exposed in a lithography process for manufacture of a semiconductor device, said mask characterized by;

including a reflector portion having a multi-layer film structure made by repetitively stacking a plurality of layers in the same order and an absorption film portion covering the reflector portion with a predetermined pattern;

wherein said mask is structured so that there is a phase difference between reflection light of exposure light from said reflector portion and reflection light of said exposure light from said absorption film portion, and that in said reflection portion a periodical length of a repetitive stack unit of said multi-layer film structure and a film thickness ratio between the plurality of layers constituting said repetitive stack unit are set so that a center of full width at half maximum of a reflectance via a predetermined number of reflectors becomes coincident with a center wavelength of exposure light to be reflected.

11. A mask according to claim 10, wherein said mask is a phase shift mask.

12. A mask according to claim 10;

wherein said exposure light is any one of extreme ultraviolet light, ultraviolet light, an electron beam, an X-ray, a charged particle ray, a radial ray, or a visible light.

13. A mask according to claim 10;

wherein said multi-layer film structure is made by stacking constituted of Si and Mo in the same order.

14. A mask according to claim 12;

wherein said multi-layer film structure is stacked on a glass substrate comprising SiO_2 from said glass surface toward the surface of said reflector.

15. A mask according to claim 10;

wherein said buffer layer comprises Ru (ruthenium).

16. A mask according to claim 15;

wherein a light reflection surface side of said reflector is covered with TaN (tantalum nitride)

17. An exposure apparatus used when exposure light is exposed to a subject to be exposed in a lithography process for manufacture of a semiconductor device, characterized by:

including a predetermined number of reflectors for exposure light, said reflector having a multi-layer film structure made by repetitively stacking a plurality of layers in the same order;

wherein in said reflector for exposure light a periodical length of a repetitive stack unit of said multi-layer film structure and a film thickness ratio between the plurality of layers constituting said repetitive stack unit are set so that a center of full width at half maximum of a reflectance via said predetermined number of reflectors becomes coincident with a center wavelength of exposure light to be reflected.

18. An exposure apparatus according to claim 17;

wherein said exposure light is any one of extreme ultraviolet light, ultraviolet light, an electron beam, an X-ray, a charged particle ray, a radial ray, or a visible light.

19. A semiconductor device manufacture method characterized

by:

including a reflector portion having a multi-layer film structure made by repetitively stacking a plurality of layers in the same order and an absorption film portion covering the reflector portion with a predetermined pattern;

wherein exposure light is exposed to a subject to be exposed in a lithography process for manufacture of a semiconductor device;

by using a mask structured so that there is a phase difference between reflection light of exposure light from said reflector portion and reflection light of said exposure light from said absorption film portion, and that in said reflection portion a periodical length of a repetitive stack unit of said multi-layer film structure and a film thickness ratio of said plurality of layers constituting said repetitive stack unit are set so that a center of full width at half maximum of a reflectance via a predetermined number of reflectors becomes coincident with a center wavelength of exposure light to be reflected.

20. A semiconductor device manufacture method according to claim 19;

wherein said exposure light is any one of extreme ultraviolet light, ultraviolet light, an electron beam, an X-ray, a charged particle ray, a radial ray, or a visible light.